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Gov't Agency/Lab The Subject '1'ethnology was Developed by/For: NASA and DOD

Contract No, (if applicable):

Paper Title: Polarimetric Hyperspectral imaging

Category: Environmental Technology, Video/Imaging

Description:

Recently, JPL developed a prototype system for evaluating potential applications of a polarimetric hyperspectral imaging (PHI) technology using the noncollinear acousto-optic tunable filter (AOTF). The filter has a large angular aperture suitable for imaging applications, because it uses the acousto-optic diffraction process between ordinary and extraordinary waves in a birefringent crystal, The process creates two separated diffracted beams with polarization orthogonal to each other, creating polarization measuring capability, The selection of operating wavelength is clone by tuning the frequency of a RF power applied to a transducer mounted on the crystal, providing operational flexibility. The tuning time is fast, about 10 microseconds. Furthermore, AOTFs can provide high spectral resolution ($\lambda/\Delta\lambda$) of 102-104, giving opportunities to characterize spectral properties of objects in details, Consequently, an AOTF-PHI instrument is expected to provide a full characterization of light from an object,

in the past, two AOTF-PHI breadboard systems, one operating in the 0.48-0.76pm range and the other in the range of 1.2 to 2.5 μm, were developed and evaluated for remote sensing applications. Recently, JPL has developed a visible/near-jnfrarcd AOTF-PHI prototype system and has done a number of outdoor field experiments for evaluating technology potentials. The results not only demonstrate the AOTF-PHI capability to provide high quality polarization and spectral images, but also reveal the technology feasibility for a wide range of applications, including space exploration, environmental monitoring, military surveillance, scient ific research, agriculture and forestry management, as well as medical research and diagnosis.

'l'his paper presents polarimetric hyperspectral image data of outdoor scenes and laboratory samples as examples to illustrate application potentials of the AOTF-PHI technology,